

# ***STP Quarterly Review***

**23 Jan 2013**

**1QFY13**



**William Denig**

**Solar & Terrestrial Physics Division**

**NOAA/NESDIS/NGDC**

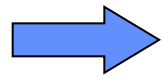
**303 497-6323**

**[William.Denig@noaa.gov](mailto:William.Denig@noaa.gov)**



# OUTLINE

## Solar & Terrestrial Physics Division



### **STP Division Overview**

**Milestones & Performance Measures**

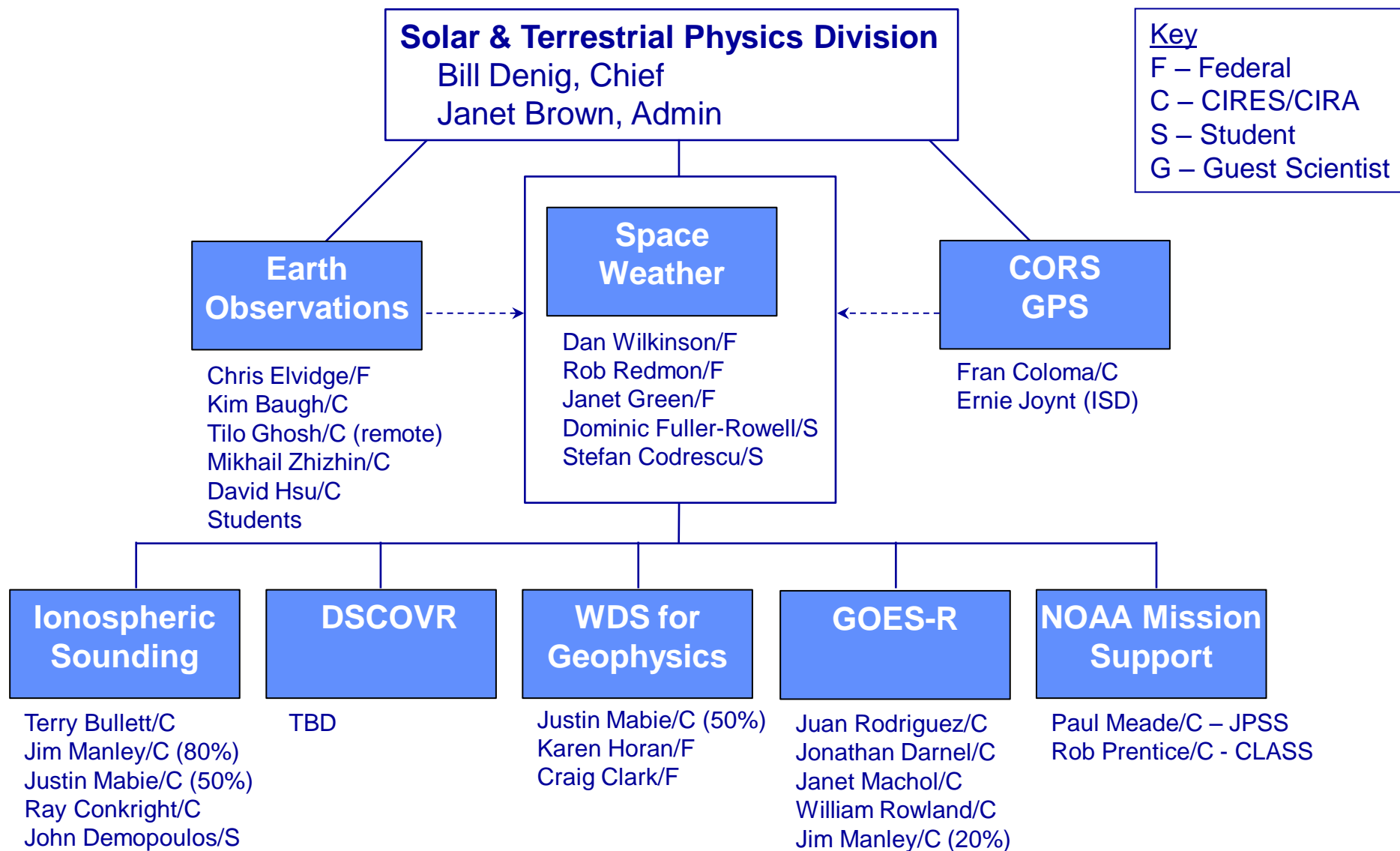
**Accomplishments & Updates**

**Issues & Summary**



# STP Division Overview

## Personnel





# STP Division Overview

## Personnel Changes



- Gains
  - John Demopoulos (Student) – Ionosonde Program
- Losses
  - Pat Purcell – Transferred to NASA/JPSS Program Office
  - Mary Shouldis – Searching for new opportunities
- Reassignments
  - Jim Manley supporting GOES-R/Personnel @ 20%
- Inbound
  - None
- Vacancies
  - Space Weather Physicist (Federal) – Solar Program/SXI-SUVI
  - Programmer (CIRES) – vice Elespuru – 50% with MGG (ISD action)
  - GOES-R/DSCOVR Systems Engineer (CIRES/) – active search



# STP Division Overview

## Balance Sheet – FY13 (Estimated)



<b>Income</b>			
	FY12 Carryovers	FY13 Income	Total
Base Allotment (estimate)		\$1,200,000	\$1,200,000
NASA ROSAS (Green)		\$113,612	\$113,612
NASA KNIPP (Redmon)		\$20,000	\$20,000
SPSRB (Redmon)		\$64,400	\$64,400
GOES-R (PN76)		\$137,500	\$137,500
GOES-R (PN77)		\$509,620	\$509,620
GOES-R (Cal/Val)		\$300,000	\$300,000
DSCOVN Data Stewardship		\$244,000	\$244,000
OD Program Support		\$242,979	\$242,979
NASIC		\$100,000	\$100,000
JPSS Imagery Team		\$75,000	\$75,000
JPSS Proving Ground		\$145,000	\$145,000
World Bank		\$50,000	\$50,000
NTL Data Sales	\$81,856	\$35,000	\$116,856
McMurdo (DMSP)		\$56,000	\$56,000
CORS		\$208,000	\$208,000
Total Income	\$81,856	\$3,501,111	\$3,582,967
<b>Expenses</b>			
	FY12 Paybacks	FY13 Expenses	Total
Salaries		\$2,611,314	\$2,611,314
Travel		\$41,000	\$41,000
ISD Support		\$216,531	\$216,531
Miscellaneous		\$97,638	\$97,638
OD overhead		\$201,653	\$201,653
FY14 Forward Funded			
Total Expenses		\$3,168,137	\$3,168,137
<b>Balance Sheet</b>			
	Net FY12	Net FY13	Net
Balance Sheet	\$81,856	\$332,974	\$414,830

**+ \$3,582,967**

**- \$3,168,137**

**Net \$414,830**

As of 04 Jan 13



# STP Division Overview

## Agreements – Status



Agreements											
Scope	Team	Type	Partner	NOAA Legal	DOC Legal	NGDC Signed	Partner Signed	Start	End	Status	
CORS Support	CORS	AGR	NGS	n/a	n/a	X	X	10/01/2003	09/30/2013	G	In place - IC complete
SWx Climatology	SWX	MOU	AFCCC	X	X	X	X	05/27/2004	10/01/2014	G	In place - no FY12 activity
GPS Data (CORS)	SWX	MOA	Multi	n/a	n/a	X	X	09/20/2004	TBD	G	Biannual Review - waiting on NGS
DMSP Archive	NTL	MOA	DMSP	X	X	X	X	05/30/2007	09-30/2009	Y	Under review
Ionosonde Sites	SWX	IA	USGS	X	X	X	X	04/03/2009	04/03/2013	G	In place - FY12 site support
ViRBO	SWX	MOA	NASA	X	X	X	X	04/15/2009	n/a	G	In place - no FY12 activity
SEM-N - AFRL	SWX	MOA	AFRL	X	X	X	X	05/11/2009	05/11/2014	G	In place - DWSS cancelled
Nighttime Lights	SWX	MOU	DOE	X	X	X	X	08/12/2009	08/12/2013	G	In place - nothing to report
NASIC	NTL	MOU	NASIC	X	X	X	X	03/09/2011	01/30/2015	G	In place - nothing to report
Gas Flaring	NTL	SA	WBank	X	X	X	X	05/22/2012	06/30/2013	G	In place - nothing to report
Global CO2	NTL	AGR	NASA	n/a	n/a	n/a	n/a	07/29/2011	09/30/2012	G	To be renewed
SEM-N Algorithms	SEG	MOU	SMC	X	X	X	X	08/01/2011	07/31/2013	G	In place - DWSS cancelled
										As of 17 Jan 2013	
										G	No Action Needed
										Y	Watch Item
										R	Action Required



# STP Division Overview

## Agreements – USAF Data



➔ USAF has no stated “requirements” to archive DMSP and/or SWx data (unclassified) – it is unlikely that the AF will provide any funding to support this activity. AFW has been informed that this service is now provided on a “best effort” only.

### AFWA direct

- DMSP – full data stream (SIMPLE format) from Thule and McMurdo; smooth/fine
- NEXION – *tbd* – under discussion
- ISOON – *tbd* – future? (Interim GONG – *tbd*)

### SEON (SOON & RSTN) Sites via Mail (monthly)

- SOON Sunspot Drawings – paper originals – *now received electronically [TBD]*
- RSTN datafiles – CD – includes:
  - ✓ Metrics – Station metrics (up/down time, etc)
  - ✓ RIMS – Fixed frequency data – 1 sec, up to 8 frequencies
  - ✓ SRS – Swept frequency data
  - ✓ WNDS – Semi-automatic messages generated by the WNDS (operator input)

### AFRL (APL & NRL – *tbd*) – Daily ftp

- Processed DMSP SWx sensor data (SSJ/SSIES/SSM; SSUSI/SSULI – *tbd*)

### University of Massachusetts, Lowell

- Ionosonde – DIDBase – ionograms in SAO/XML format

### Space Weather Prediction Center – various processed datasets





# STP Division Overview

## GOES Spacecraft/Instrument Status



Spacecraft	Series	Operational Status	Status	Magnet1	Magnet2	Magnetometer 1	Magnetometer 2	MAG	XRS	XRS-EUV	EXIS	EPS	HEPAD	SEISS	XRP	SXI	SUVI
GOES 8	GOES I-M	Decommisioned	R	G	G				G			G	G		G		
GOES 9	GOES I-M	Decommisioned	R	G	G				G			G	G		G		
GOES 10	GOES I-M	Decommisioned	R	G	G				G			Y	G		G		
GOES 11	GOES I-M	Decommisioned	R	G	G				R			G	G		R		
GOES 12	GOES I-M	South America	G	G	G				R			Y	G		R	R	
GOES 13	GOES N-O-P	Operational East	G			G	G			Y		G	G			Y	
GOES 14	GOES N-O-P	Standby	G			G	G			G		G	G			G	
GOES 15	GOES N-O-P	Operational West	G			G	G			G		G	G			G	
GOES R	GOES R	Acquisition						TBD			TBD			TBD			TBD
GOES S	GOES R	Acquisition						TBD			TBD			TBD			TBD

As of: 16 Jan 2013

Operational (or capable of)	G
Operational with limitations (or Standby)	Y
Operational with Degraded Performance	O
Not Operational	R
Status Unknown	TBD



Note: SWPC operations use GOES-15 SEM & SXI, GOES-14 SEM & SXI, GOES-13 SEM (no XRS). SWPC stopped processing POES data on 01Jan13 – NGDC still troubleshooting capability to locally generate POES products.





# STP Division Overview

## STP Annual Data Ingest<sup>1</sup> – 1QFY13



	<b>CY10 GB</b>	<b>CY11 GB</b>	<b>CY12 GB</b>
<b>GOES SEM</b>	71	71	80
<b>GOES SXI</b>	870	1,731	1899
<b>POES SEM</b>	30	29	29
<b>DMSP OLS</b>	5,540	5,130	5,020
<b>CORS GPS</b>	20,198	24,456	25,611
<b>Ionosonde</b>	1,400	900	907 <sup>2</sup>

<sup>1</sup>Uncompressed data volumes

<sup>2</sup>Does not include VIPIR (29 TB)

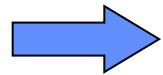


# OUTLINE

## Solar & Terrestrial Physics Division



### **STP Division Overview**



### **Milestones & Performance Measures**

### **Accomplishments & Updates**

### **Issues & Summary**



# Milestones & Performance Measures

## FY13 STP Milestones



FY13 Milestones		+-----FY13-----+			
Space Weather Program		Q1	Q2	Q3	Q4
Spacecraft Charging	Host technical workshop on the release of the next generation radiation belt models referred to as AP9/AE9 (Green/1QFY13)	C			
PeEPS	Demonstrate at the American Geophysical Union 2012 Fall Meeting new capabilities for the social media utility referred to People Empowered Products (Green-Redmon/1QFY13)	C			
DMSP SWx	Develop an 11-year database of calibrated precipitating electron and ion fluxes from the Defense Meteorological Satellite Program Special Sensor Electron and Ion Spectrometer (Redmon/3QFY13)			G	
World Data Service					
Monthly Bulletins	Resume monthly production of the NOAA/NGDC Geomagnetic Indices Bulletin and Solar Indices Bulletin (Mabie-Clark/1QFY13)	C			
Ionosonde Data Services					
Ionosonde Installation	Promote scientific research within Africa by installing a new-generation, advanced research ionospheric sounder at Maseno University on the equator near Kisumu, Kenya (1QFY13/Bullett/1QFY13)	C			
GOES-R Program Support					
GOES-R Cal/Val	Identify and complete key tasks for GOES-R space weather calibration-validation [vice Shouldis/1QFY13]	C			
GOES-R RR/AR	Complete Critical Design Reviews for selected Level 2+ ground-processing algorithms for the GOES-R space weather sensors (vice Shouldis/3QFY13)			G	
DSCOVR Program Support					
DSCOVR RTA	Prepare and submit to the NGDC Data Manager a Request To Archive (RTA) for space environmental data from the NOAA Deep Space Climate Observatory (DSCOVR) mission (TBD/1QFY13)	Y			
DSCOVR CONOPS	Prepare a high-level CONcept of Operations (CONOPS) for the Archive, Access, and Assessment (AAA) of solar wind data from the Deep Space Climate Observatory (DSCOVR) mission (TBD/1QFY13)	Y			
DSCOVR SA	Draft an initial Submission Agreement (SA) for acquiring processed Deep Space Climate Observatory (DSCOVR) data received from the NWS Space Weather Prediction Center (TBD/2QFY13)		G		
SPADES	Develop key functional elements of the Satellite Product Analysis and Distribution Enterprise System (SPADES) to support the Deep Space Climate Observatory (DSCOVR) mission (TBD/3QFY13)			G	
DSCOVR ICD	Prepare a draft Interface Control Document (ICD) for the the NGDC-to-archive interface for the Deep Space Climate Observatory (DSCOVR) mission data (TBD/4QFY13)				G
Earth Observations					
VIIRS Gas Flares	Use Soumi National Polar Partnership (S-NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) data to produce a global map of detected gas flares ranked from largest to smallest (Elvidge/4QFY13)				G
VIIRS Nighttime Lights	Create a global cloud-free composite map of nighttime lights derived from Soumi National Polar Partnership (S-NPP) Visible Infrared Imaging Radiometer Suite (VIIRS)S data (Elvidge/4QFY13)				G
		As of 21 Jan 13			



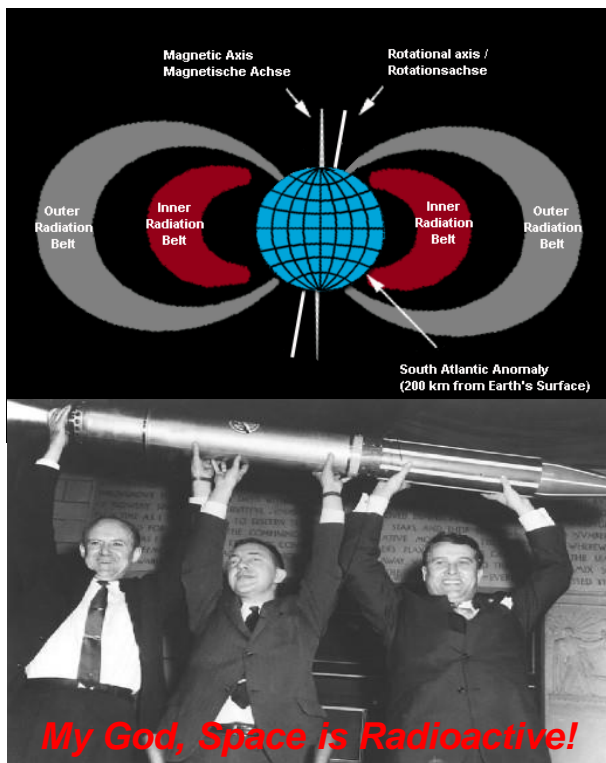
# Milestones & Performance Measures

## AE9 / AP9



**Milestone:** Host technical workshop on the release of the next generation radiation belt models referred to as AP9/AE9 (Green/1QFY13)

**Status:** Completed – Meeting held 10 Oct 2012 in conjunction with the International Organization for Standards (ISO). Meeting involved over 40 participants from Russia, Japan, England, Italy, France and the U.S. Japan. Meeting host (Kent Tobiska) complimented NGDC on the “best ever organized ISO meeting.”





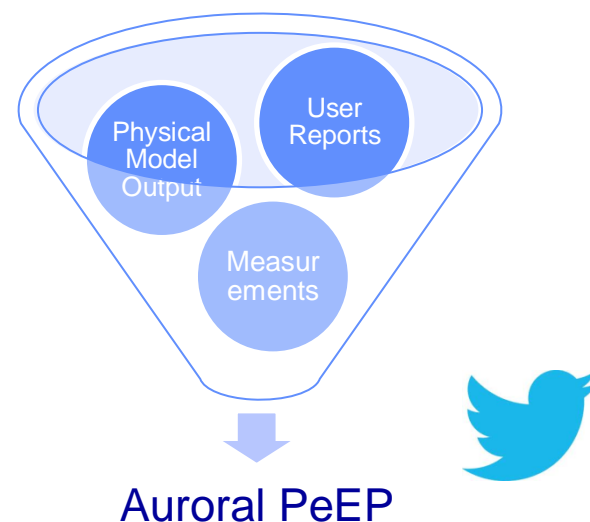
# Milestones & Performance Measures

## People Empowered Product (PeEP)



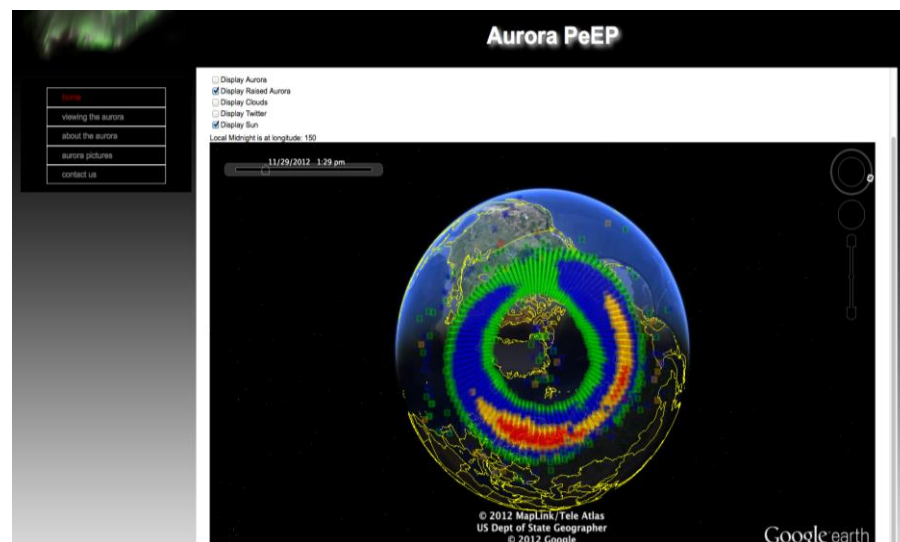
**Milestone:** Demonstrate at the American Geophysical Union 2012 Fall Meeting new capabilities for the social media utility referred to People Empowered Product (Green-Redmon/1QFY13)

**Status:** Completed – Auroral PeEP combines Twitter auroral sightings with Ovation predicted aurora model. Peeps concept presented at Fall AGU. Met with ARC to define auroral PeEP R2O. Currently collaborating with Cornell human factors and ergonomics graduate student to improve visual presentation.



PeEP's: generic framework to incorporate user reports into NOAA real time and retrospective weather products

**Wind Map  
Example  
Superstorm  
Sandy**







# Milestones & Performance Measures

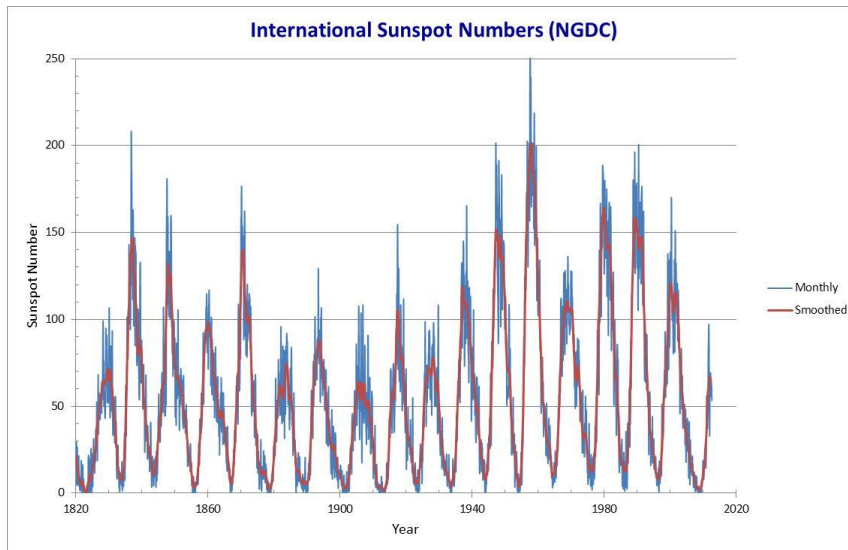
## GIBs and SIBs



**Milestone:** Resume monthly production of the NOAA/NGDC Geomagnetic Indices Bulletin and Solar Indices Bulletin (Mabie-Clark/1QFY13)

**Status:** Completed – Monthly of the GIBs and SIBs has now been resumed. Latest SIB is 10/2012 and GIB is 08/2012.

The indices data used for these monthly publications are assembled from a variety of definitive sources. Online access to the indices data remains a popular STP product available through the World Data Service for Geophysics (and the Space Environment), Boulder.



### GEOMAGNETIC INDICES BULLETIN

National Geophysical Data Center  
Solar-Terrestrial Physics Division  
325 Broadway  
Boulder, CO 80305-3328

AUGUST 2012

Telephone: 303-497-6135  
fax: 303-497-6513

### SOLAR INDICES BULLETIN

OCTOBER 2012

National Geophysical Data Center  
325 Broadway, E/GC2  
Boulder, CO 80305-3328

Solar Terrestrial Physics Division  
Telephone: 303-497-6135

#### • SOLAR RADIO EMISSIONS

The quiet Sun emits radio energy with a slowly varying intensity. These radio fluxes, which stem from atmospheric layers high in the chromosphere and low in the corona, change gradually from day-to-day, in response to the number and size of spot groups on the solar disk. The table below gives daily measurements of this slowly varying emission at selected wavelengths between about 1 and 100 centimeters. Many observatories record quiet-Sun radio fluxes at the same local time each day and correct them to within a few percent for factors such as antenna gain, bursts in progress, atmospheric absorption, and sky background temperature. At 2800 megahertz (10.7 centimeters) flux observations summed over the Sun's disk have been made continuously since February 1947.

frequency interval. One solar flux unit equals  $10^{-22}$  W/m<sup>2</sup>Hzsec. During periods of low solar activity, the flux never falls to zero, because the Sun emits at all wavelengths with or without the presence of spots. The lowest daily Ottawa flux since 1947 occurred on November 3, 1954. On that day the observed noon value dropped to 6.26 units; the highest observed value of 457.0 occurred on April 7, 1947.

The preliminary observed and adjusted Penticton fluxes tabulated here are the "Series C" values reported by Canada's Dominion Radio Astrophysical Observatory in Penticton, British Columbia. Observed numbers are less refined, since they contain fluctuations as large as ±7% from the continuously changing sun-earth distance. Adjusted fluxes have this variation removed; they show the energy received at the mean distance between the Sun and Earth. Gaps in the Palaua, Hawaii (PALE), data reflect equipment problems. Fluxes measured either at Sagamore Hill, Massachusetts, or at San Vito, Italy, will be substituted for frequencies at which many Palaua values are missing.

#### • SOLAR FLUX TABLE

Numbers in parentheses in the column headings below denote frequencies in megahertz. Each entry is given in solar flux units—a measure of energy received per unit time, per unit area, per unit

Day	Cal	Year	Bart	Sunspot Number	Obs Flux	Pentic	RSTN (2800)	RSTN (15400)	RSTN (8930)	Pentic (4955)	RSTN (2800)	RSTN (2655)	RSTN (1415)	RSTN (610)	RSTN (410)	RSTN (245)	Observed	Adjusted
Day																	(2800)	(2800)
1	214	13																
2	215	14																
3	216	15																
4	217	16																
5	218	17																
6	219	18																
7	220	19																
8	221	20																
9	222	21																
10	223	22																
11	224	23																
12	225	24																
13	226	25																
14	227	26																
15	228	27																
16	229	1																
17	230	2																
18	231	3																
19	232	4																
20	233	5																
21	234	6																
22	235	7																
23	236	8																
24	237	9																
25	238	10																
26	239	11																
27	240	12																
28	241	13																
29	242	14																
30	243	15																
31	244	16																
Mean																		
*preliminary																		
1	54	128	593	296	156	128	123	106	70	46	20						145.6	148.2
02	51	118	579	290	145	118	112	97	65	42	21						142.3	144.7
03	44	112	515	280	143	113	109	90	60	42	19						141.6	144
04	43	110	495	268	137	110	106	87	69	40	19						137.6	139.9
05	42	106	564	278	134	106	102	85	60	39	22						132.7	134.9
06	30	99	573	283	130	99	94	79	56	38	18						128	130
07	28	96	576	272	129	96	96	78	56	39	17						133.4	135.4
08	34	103	577	275	134	103	99	82	55	37	15						128.6	130.5
09	49	105	568	290	139	106	102	82	54	37	17						123	124.8
10	53	112	474	268	140	112	105	84	52	37	12						111.3	112.8
11	51	117	579	267	137	117	107	87	55	37	18						105.1	106.4
12	58	122	529	278	142	122	113	91	57	38	19						102.6	103.8
13	56	125	583	273	142	125	118	94	69	38	19						99.1	100.3
14	56	132	483	280	149	132	124	101	59	39	22						100.5	101.7
15	83	137	581	286	152	137	128	107	61	41	44						97.5	98.6
16	80	137	595	283	149	137	130	113	60	41	37						97.3	98.3
17	71	135	600	299	157	135	127	108	66	41	30						101.5	102.5
18	76	138	596	289	154	138	130	118	66	46	27						104.3	105.3
19	66	141	575	294	158	141	138	122	66	45	30						109.8	110.8
20	51	151	598	302	163	151	141	127	69	45	26						117.4	118.4
21	57	144	600	303	162	144	137	120	67	48	25						116.9	117.8
22	59	156	599	304	165	156	136	119	67	46	23						124.5	125.3
23	64	142	597	300	166	142	133	118	76	45	22						133.6	134.4
24	66	136	588	298	160	136	126	114	73	44	35						136.6	137.4
25	55	130	588	290	154	130	123	106	73	51	34						139.8	140.6
26	54	131	580	290	156	131	126	109	73	42	24						139.2	139.9
27	47	122	574	288	150	122	114	100	62	38	36						133.2	133.8
28	37	117	566	284	154	117	114	94	65	47	33						137.8	138.3
29	48	108	521	273	139	108	101	87	62	43	17						136	136.4
30	45	106	575	275	137	106	99	86	62	38	19						135.6	135.9
31	35	104	568	270	134	104	98	84	60	35	19							
Mean	53.3	123	568	285	147	123	116	99	63	41	24						123	124.3

SOLAR INDICES BULLETIN (continued)

OCTOBER 2012



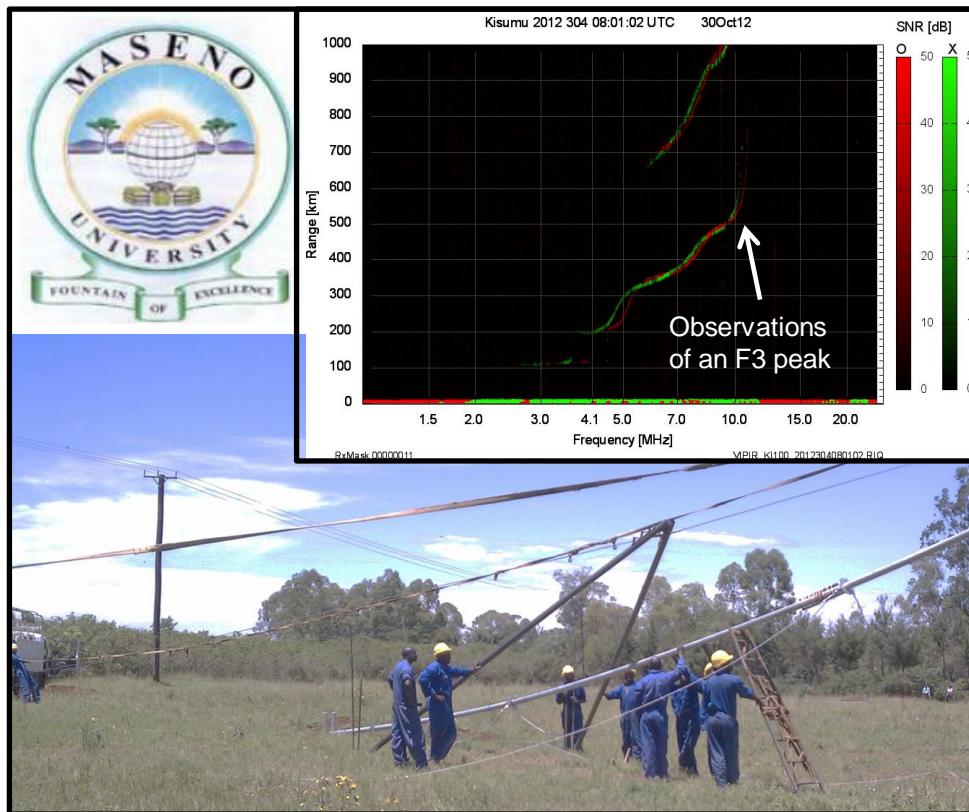
# Milestones & Performance Measures

## Promoting Space Research in Africa



**Milestone:** Promote scientific research within Africa by installing a new-generation, advanced research ionospheric sounder at Maseno University on the equator near Kisumu, Kenya (1QFY13/Bullett/1QFY13)

**Status:** Completed – New sounder at Maseno University is up and operating (26 Oct 12). Still working some remaining logistical COMM issues.







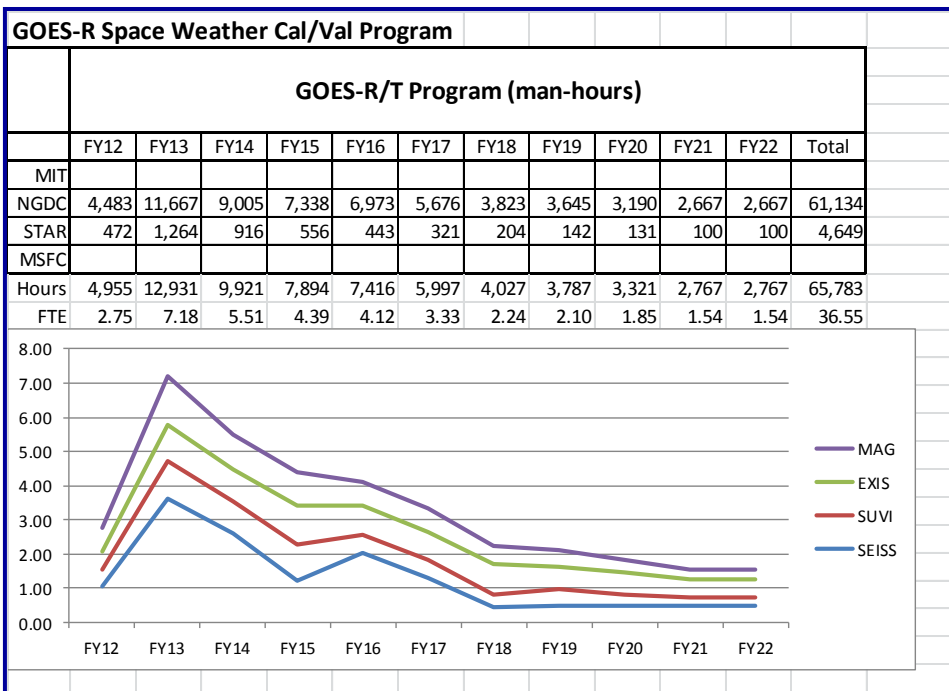
# Milestones & Performance Measures

## GOES-R Cal/Val



**Milestone:** Identify and complete key tasks for GOES-R space weather calibration-validation [vice Shouldis /1QFY13])

**Status:** Completed – Initial Cal/Val Execution Plan submitted; non-executable as is; disconnects being addressed at the Program Level.



Effective Date: 02/14/11  
Expiration Date: 02/01/16  
Responsible Organization: GOES R Program/Code 417

P417-R-PLN-0101  
Version 2.0



## GOES-R Series Calibration/Validation Plan Volume 1: Level 1b Data

April 2012



U.S. Department of Commerce (DOC)  
National Oceanic and Atmospheric Administration (NOAA)  
NOAA Environmental Satellite, Data, and Information Service (NESDIS)  
National Aeronautics and Space Administration (NASA)

THIS DOCUMENT IS SUBJECT TO ITAR CONTROL, AND MAY CONTAIN  
INFORMATION PROPRIETARY TO GOES-R VENDORS.

Check the VSDE at <https://goes3.ndbc.nasa.gov> to verify correct version prior to use

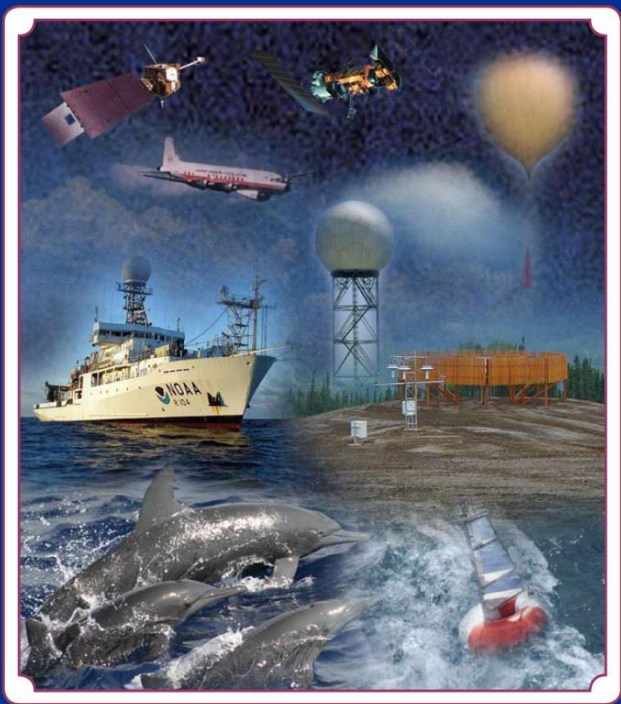


# Milestones & Performance Measures

## DSCOV R TA



### NOAA PROCEDURE FOR SCIENTIFIC RECORDS APPRAISAL AND ARCHIVE APPROVAL



*Guide for Data Users and Producers*



**Milestone:** Prepare and submit to the NGDC Data Manager a Request To Archive (RTA) for space environmental data from the NOAA Deep Space Climate Observatory (DSCOV R) mission (TBD/1QFY13)

**Status:** In process – Initial draft prepared; waiting annual funding. Interfaces still in flux.

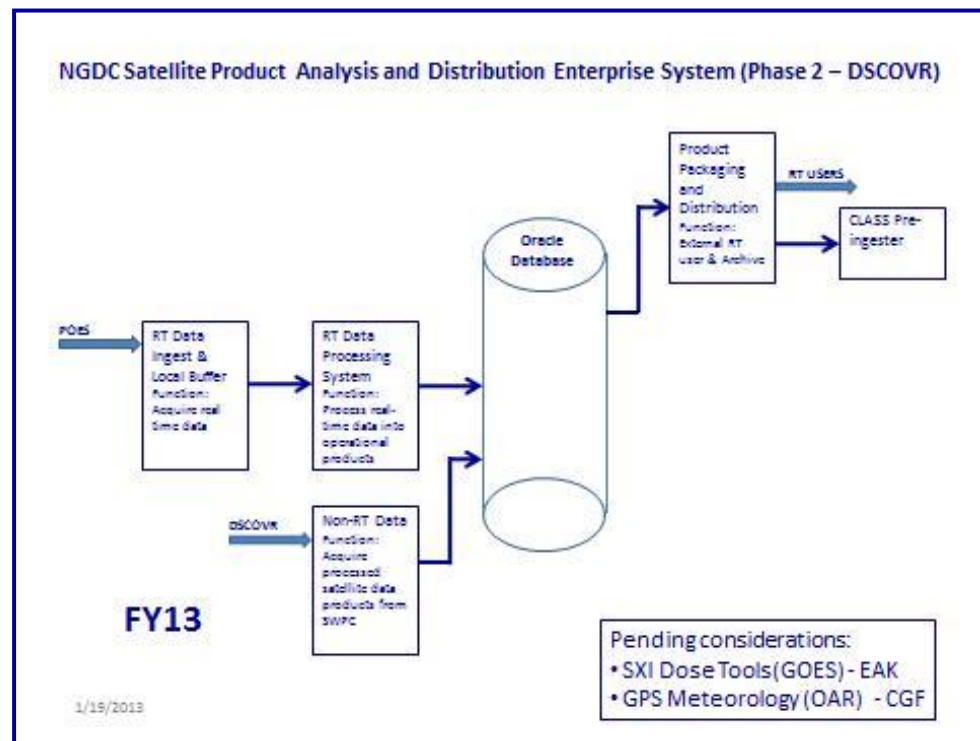


# Milestones & Performance Measures

## DSCOVER CONOPS

**Milestone:** Prepare a high-level CONcept of Operations (CONOPS) for the Archive, Access, and Assessment (AAA) of solar wind data from the Deep Space Climate Observatory (DSCOVER) mission (TBD/1QFY13)

**Status:** In process – Initial team meetings help to scope this 3QFY13 effort by the Agile S/W Development Team. DSCOVER is scheduled for a 1QFY15 launch.



**Recommend SPADES infrastructure development for CIO FY14 passback?**





# Milestones & Performance Measures

## FY13 Performance Measures



STP Annual Performance Measures							
Space Weather Metric							
Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Weather-Ready Nation (NWS)	A More Productive and Efficient Economy Through Environmental Information Relevant to Key Sectors of the U.S. Economy	Maintain a greater than 97% (2-sigma, cumulative distribution) of available Space Environment Monitor (SEM) data from the Geostationary Operational Environmental Satellites (GOES) archived on an annual basis	Wilkinson	100%			
Ionosonde							
Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Weather-Ready Nation (NWS)	Resilient Coastal Communities That Can Adapt To The Impacts Of Hazards And Climate Change	Acquire, process and disseminate >97% (2-sigma, cumulative distribution) of available real-time ionosonde data within 1 hour [TBD] of receipt	Bullett	100%			
Nighttime Lights Metric							
Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Climate Adaptation and Mitigation (CS)	Improved Scientific Understanding of the Changing Climate System and Its Impacts	Acquire, process and disseminate >97% (2-sigma, cumulative distribution) of available real-time nighttime lights imagery within 3 hours of receipt	Elvidge	100%			
CORS							
Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Resilient Coastal Communities and Economics (NOS)	Resilient Coastal Communities That Can Adapt To The Impacts Of Hazards And Climate Change	Provide a >97% (2-sigma, cumulative distribution) availability for CORS near-real-time data to the NWS Space Weather Prediction Center (SWPC) as per the '4-way' Memorandum of Agreement and subject to normal business-hour response times.	Coloma	100%			

As of 22 Jan 13



Greater than 99% (3-sigma) Cumulative Distribution



Greater than 97% (2-sigma) Cumulative Distribution



Greater than 84% (1-sigma) Cumulative Distribution



Below 84.1% (1-sigma) Cumulative Distribution



# OUTLINE

## Solar & Terrestrial Physics Division



**STP Division Overview**

**Milestones & Performance Measures**

**→ Accomplishments & Updates**

**Issues & Summary**



# Accomplishments & Updates

## NGDC in the News



The night side of our planet twinkles with light, and the first thing to stand out is the cities. "Nothing tells us more about the spread of humans across the Earth than city lights," asserts Chris Elvidge, a NOAA scientist who has studied them for 20 years.

05 December 2012



### Everything Is Illuminated

NATIONAL  
GEOGRAPHIC

Daily News

*Image courtesy NASA Earth Observatory/NOAA NGDC*

Patterns of population density emerge in this composite image of the United States released by [NASA](#) on Wednesday, part of a global composite image captured from space by a NASA and National Oceanic and Atmospheric Administration (NOAA) satellite.

The cloud-free images show the glow of natural and artificial light in what a NASA press release calls the most detailed night images yet.

The images were unveiled during the American Geophysical Union [conference](#) in San Francisco.

Published December 5, 2012



# Accomplishments & Updates

## NASA Group Achievement Award



*National Aeronautics and Space Administration*

*Presents the*

*Group Achievement Award*

*to*

*Joint Polar Satellite System Transition Team*

*For dedicated efforts and perseverance of the Joint Polar Satellite System Transition Team in enabling the advancement of the Nation's Earth system science.*

*Bill Denig*



*Signed and Sealed at Washington, DC  
this second day of August  
Two Thousand Twelve*

*CF Boldt*

*Administrator, NASA*



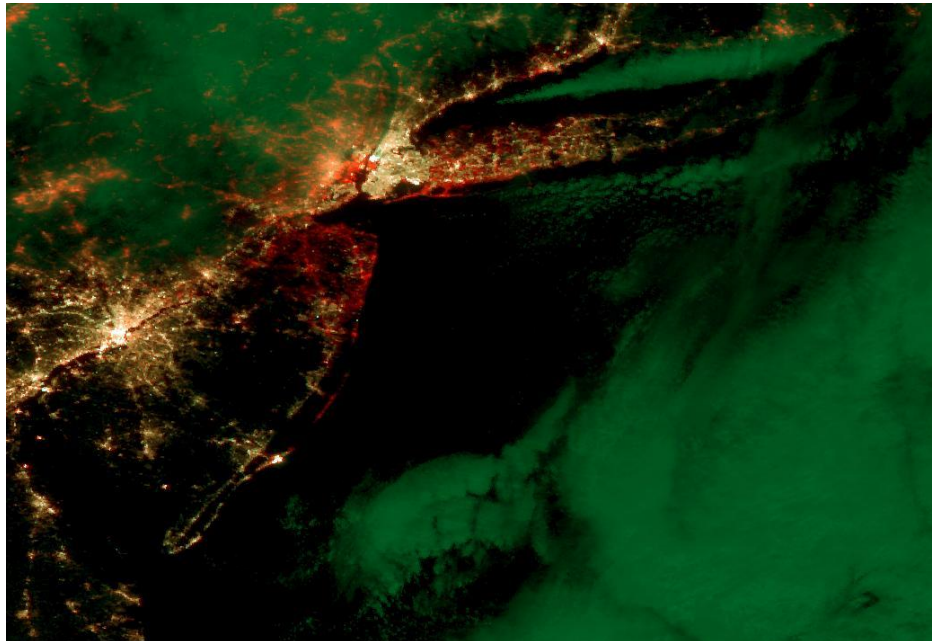


# Accomplishments & Updates

## Hurricane Sandy Power Outages



Color-composite image from the VIIRS day/night band (DNB) data reveals the locations along the Atlantic seaboard experiencing with power outages on the morning of November 1. In the color composite, areas where lighting was not detected are red and partial outages are shown as orange compared to the golden color for normal lighting conditions. Clouds in the image appear as green. Note that clouds are obscuring lights in many areas, but the central area damaged by Sandy are largely free of clouds. In New York State power outages were detected in Lower Manhattan, Staten Island, and Long Island. In New Jersey power outages were detected in Hudson, Middlesex, Monmouth, and Ocean Counties.



VIIRS DNB Image: 01 Nov 12  
Power Outage Product



Image: CBS/AP

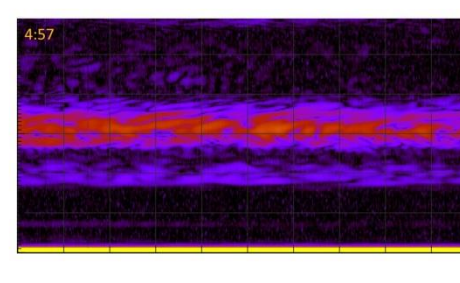
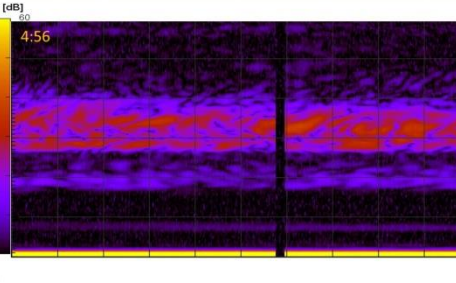
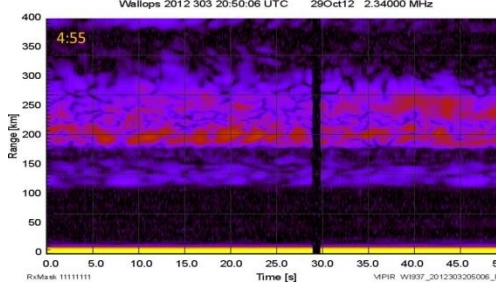
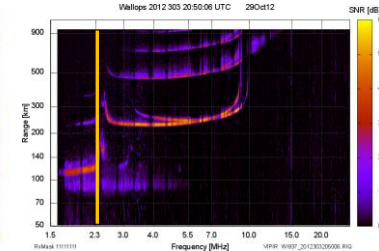
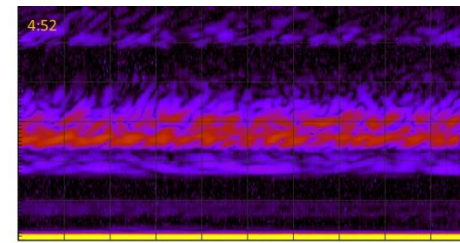
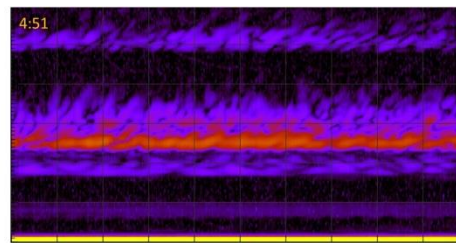
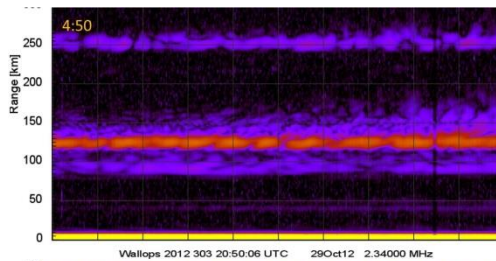
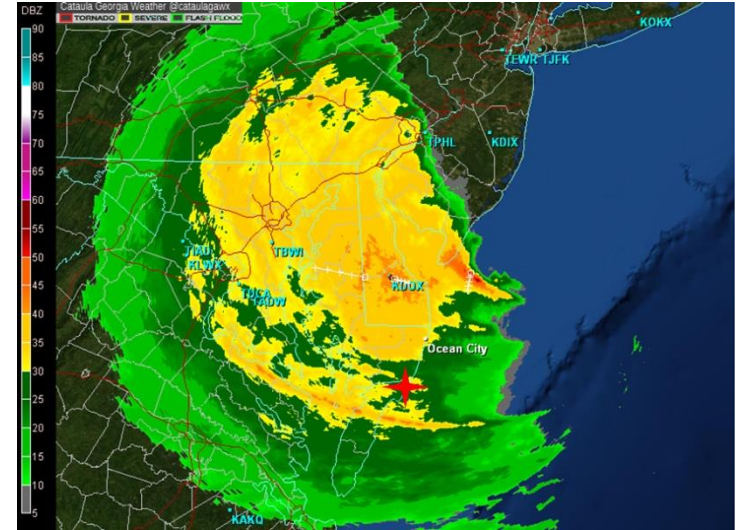


# Accomplishments & Updates

## Hurricane Sandy: VIPIR Observations



The Wallops Island VIPIR observed an ionospheric irregularity possibly associated with hurricane Sandy. The 10-minute data sequence below shows a possible gravity wave associated with a strong storm band propagating through the observation region at 20:55 UT on 29 Oct 12. These data represent the highest-ever temporal and spatial resolution ionosonde observation of a hurricane-induced ionospheric disturbance compared to the “traditional” 15-minute ionosonde sounding interval.



Ionogram

- Spread E layer
- Sporadic E layer
- Tropospheric Echo



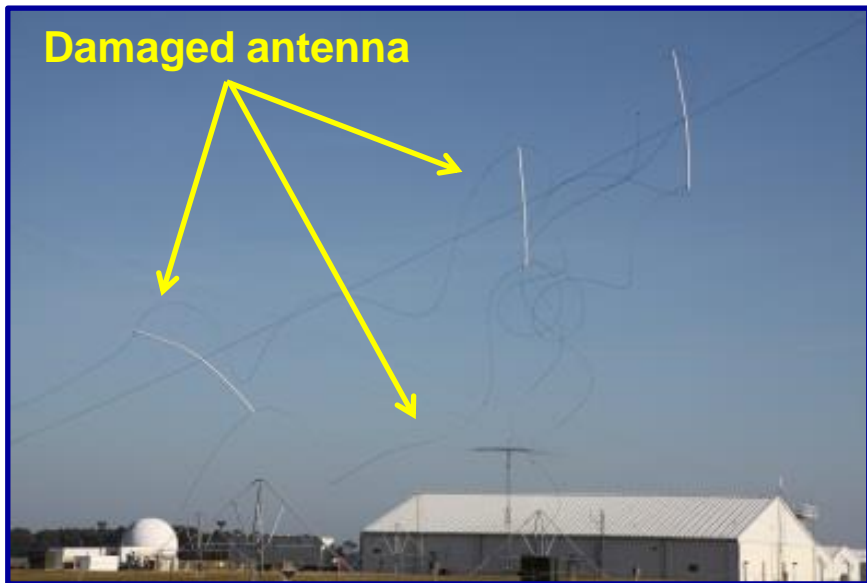


# Accomplishments & Updates

## Hurricane Sandy: Wallops Damage



Damaged antenna



Hurricane Sandy “walloped” the Wallops Island digisonde antenna

- 4 or 6 transmit elements were badly damaged (photo at left)

Repair trip allowed inspection of recent VIPIR sounder upgrades which were undamaged by the storm

- Continuous VIPIR measurements obtained during Super-storm Sandy (next slide)

Wallops  
Island  
digisonde  
repair  
activities



Genie Boom Lift sinking in soggy ground



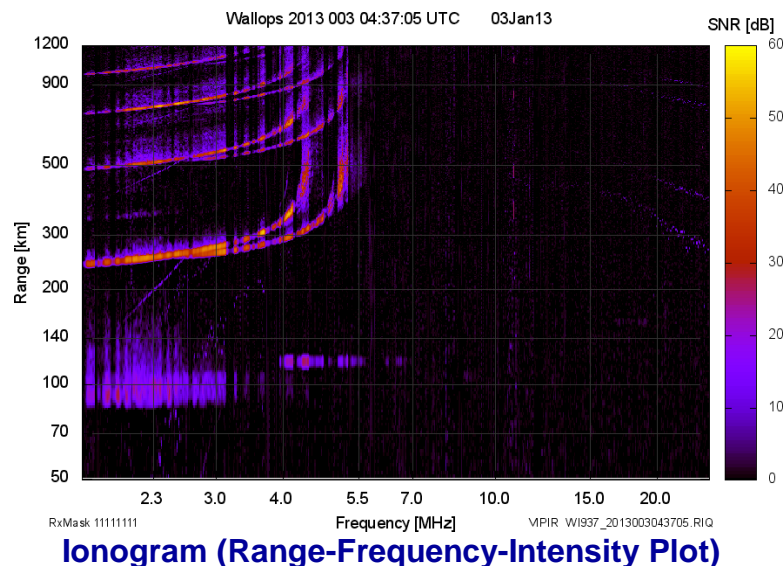
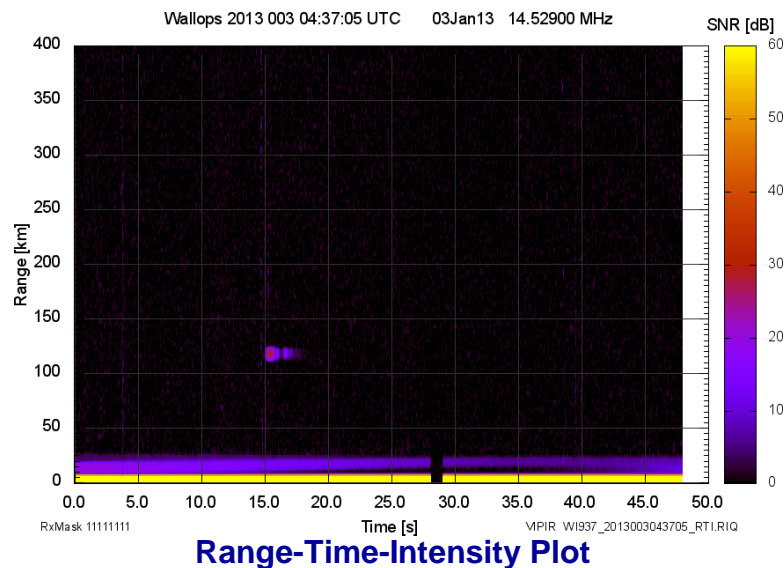
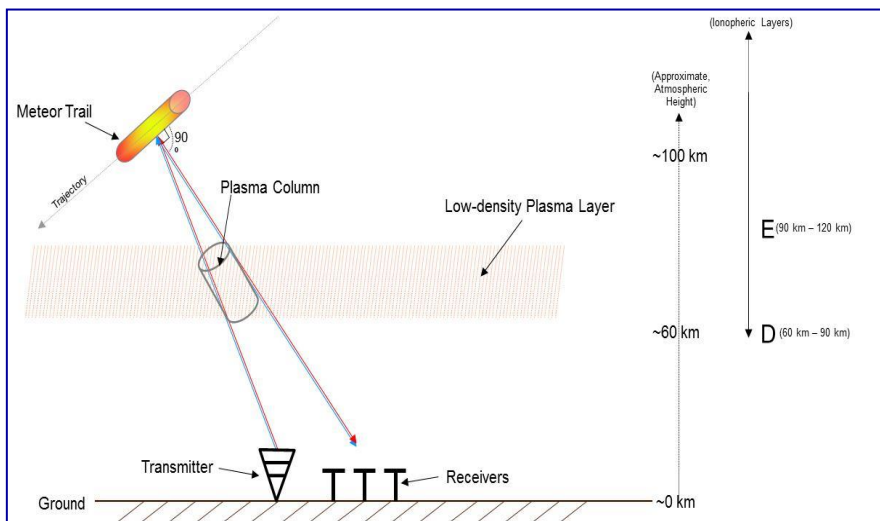
# Accomplishments & Updates

## VIPIR Observation – Meteor Trail



### *This is not your father's ionosonde!*

The Vertical Incidence Pulsed Ionospheric Radar (VIPIR) can be used to identify meteor trails within its field of view. On 03Jan the VIPIR detected a short duration ionization trail, lasting for only a few seconds and at a range of 120 km. The advanced capabilities of the VIPIR can be exploited to reveal new insights in upper atmospheric physics (“ignorosphere”).







# Accomplishments & Updates

## AMS: GOES-R Technical Posters

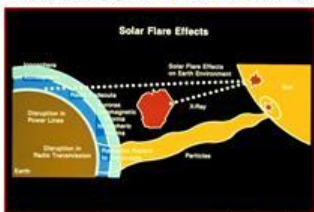


### Improved SWx Monitoring Poster 296 – SEISS

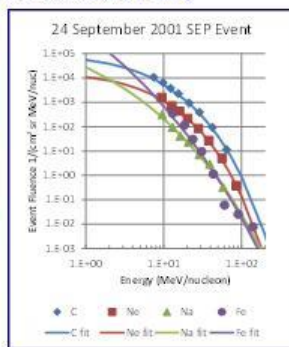


Development of a Proxy Data Set for the Energetic Heavy Ion Sensor in the GOES-R Space Environment In-Situ Suite

Authors: **Ranjeetha Bharath**, J.V. Rodriguez, J.C. Green and W.F. Denig



Space particle measurements from the NASA ACE satellite used to create sets of particle fluence curves for modeling the EHS response to solar energetic particle events. Information used to support satellite design and anomaly resolution.



1QFY13 PMR – 23 Jan 2013

25

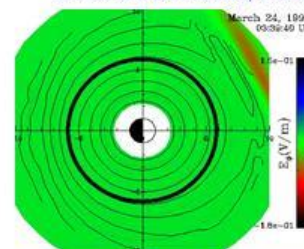


### Improved SWx Monitoring Poster 315 – MAG



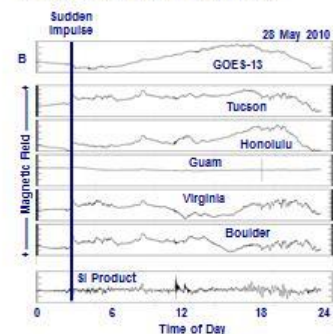
The GOES-R Sudden Impulse Detection Algorithm

Authors: **William Rowland**, R. Redmon and H.J. Singer



Results of MHD/particle simulations showing the prompt injection of energetic electrons into the inner magnetosphere during sudden commencement phase of the March 1991 superstorm. (after Elkington)

Goal – GOES-R measurements used to reliably detect sudden impulses (SI)



1QFY13 PMR – 23 Jan 2013

27

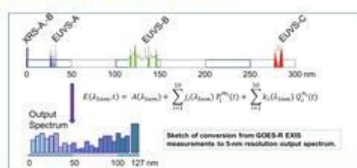
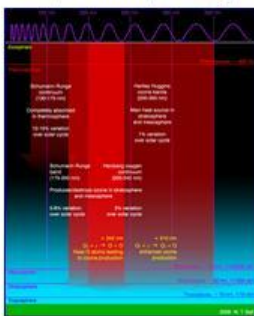


### Improved SWx Monitoring Poster 304 – EXIS



GOES-R Solar Extreme-Ultraviolet Irradiance: Requirements, Observations and Products

Authors: **Janet L. Machol**, A. Viereck, A. Reinard, F.G. Eparvier, M. Snow, A.R. Jones, T.N. Woods, W.F. Denig, D.L. Woodraska, and S.W. Mueller



Solar forcing on Earth's atmosphere is wavelength dependent. Solar extreme ultraviolet (EUV) photons and x-rays are primary energy sources to the upper atmosphere affecting satellite drag, radiowave communications and navigation, and upper atmospheric chemistry.

1QFY13 PMR – 23 Jan 2013

26



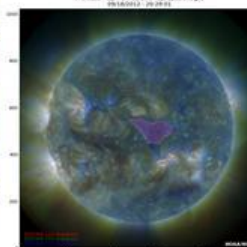
### Improved SWx Monitoring Poster 660 – SUVI



Automatic Analysis of EUV Solar Features using Solar Imagery for the GOES-R SUVI

Authors: **Jonathan Darnel**, S.M. Hill and W.F. Denig

Coronal Holes are the source of the high-speed solar wind. One of the SUVI L2+ products will automatically determine the boundaries of the coronal holes classified from the Thematic Map product and produce a list of vertices to describe each Coronal Hole. This list of vertices will aid forecasters in the prediction of changes to the solar wind speeds. Other SUVI L2+ products are maps and shapefiles of bright regions and solar flare locations.



Coronal Hole Vertices	
Longitude	Latitude
-15.85	19.26
-12.26	17.9
-11.5	15.64
-8.76	12.7
-7.27	12.56
-6.66	6.2
-5.27	2.66
-1.66	0.66
-0.62	-2.27
-1.61	-2.15
-2.22	-5.17
-1.77	-6.7
-1.73	-6.2
-2.27	-5.6
-5.66	-5.64
-7.66	-2.07
-10.7	-2.22
-12.66	-1.73
-8.25	-2.51
-20.22	6.55
-17.27	12.56
-6.61	16.64
-12.27	17.2

Coronal Shapefile

1QFY13 PMR – 23 Jan 2013

28

Team presentations at AMS included an invited talk in the opening session by Denig & Hill

# Accomplishments & Updates

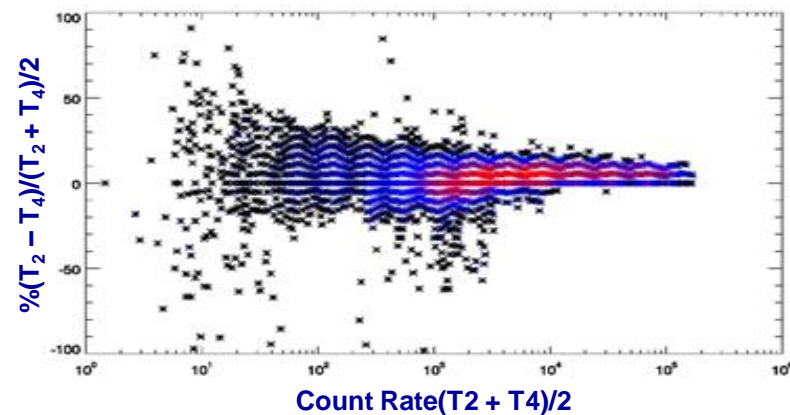
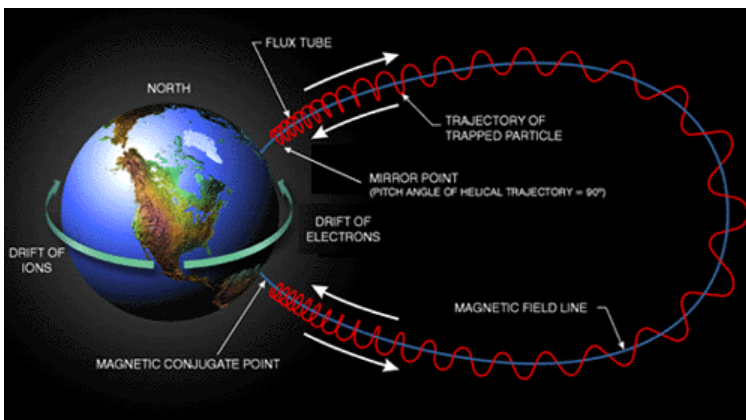
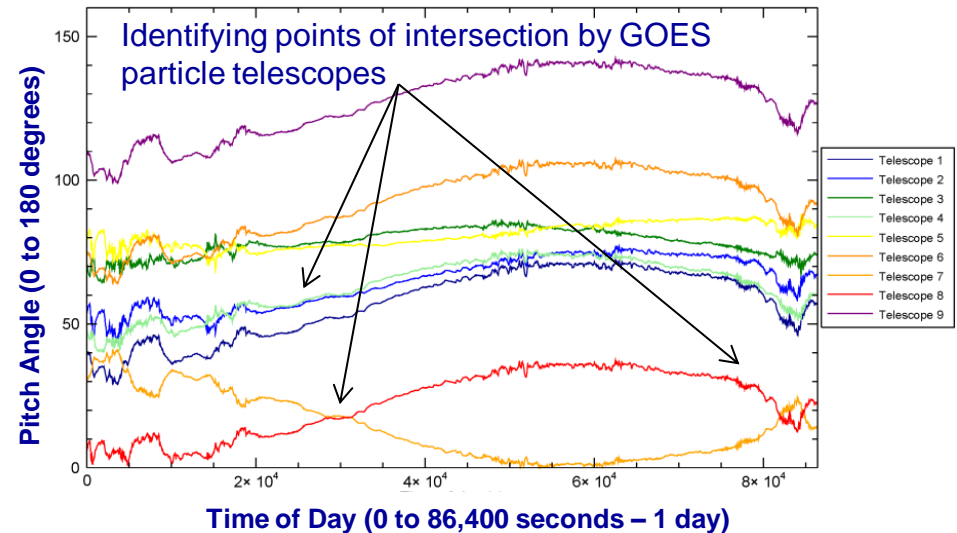
## Inter-calibrating Particle Sensors

**Paper:** Intracalibration of particle detectors on a three-axis stabilized geostationary platform, W. Rowland and R.S. Weigel, *Space Weather*, 10, S11002, doi:[10.1029/2012SW000816](https://doi.org/10.1029/2012SW000816).

**Background:** Intracalibration of particle telescopes on non-spinning satellites is problematic.

**Technique:** Compare instrument response for distinct telescopes measuring particles within the same first adiabatic invariant; i.e. sampling the same pitch angle

**Relevance:** Technique to be used to calibrate GOES energetic particle sensors as a part of GOES-R Cal-Val [TBD]





# Accomplishments & Updates

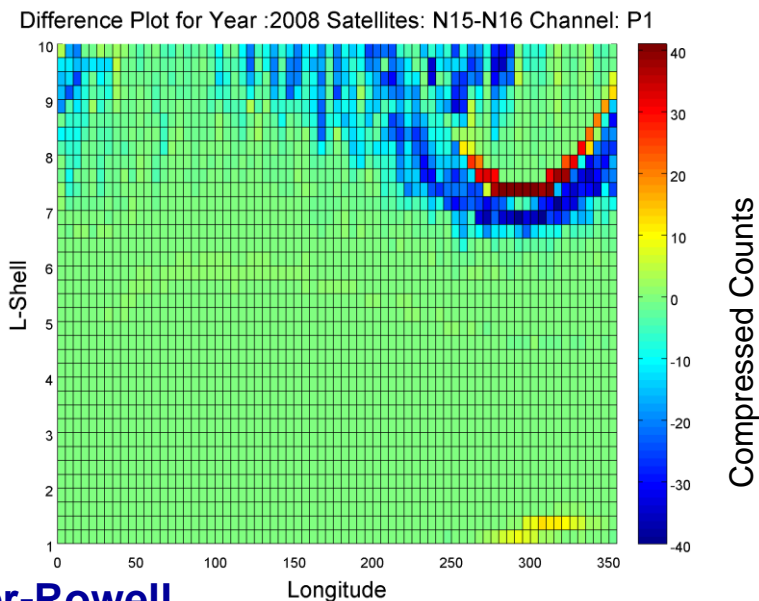
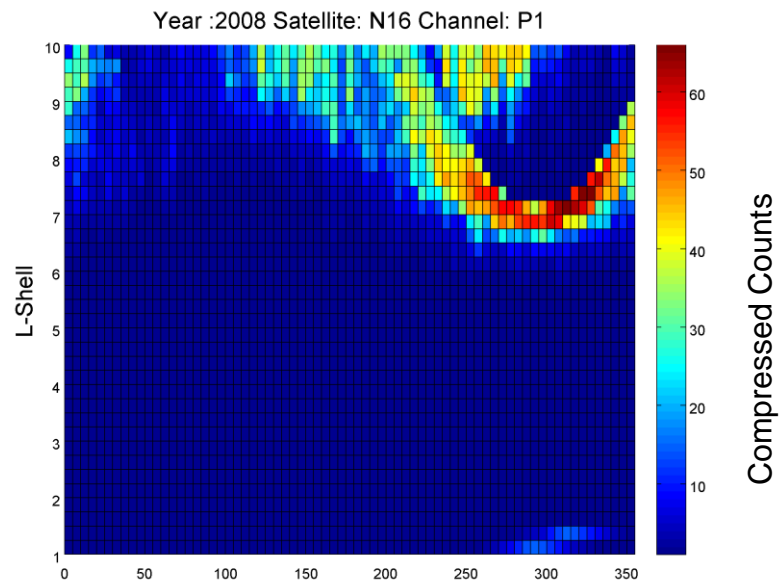
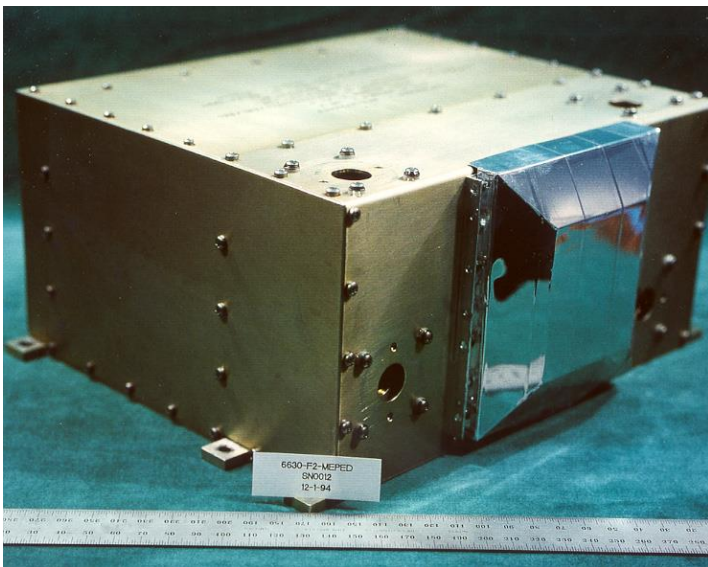
## Improving POES Data Quality



Goal – Determine trending errors in POES particle data products due to satellite sensor degradation.

Technique – Use an asynchronous regression analysis (i.e. yearly statistics) to quantify instrument differences between POES satellites over time.

Benefit – Provide the research community with a meaningful method by which to appropriately correct, trust and use the POES dataset.







# Accomplishments & Updates

## ACE Solar Wind Speeds



Background: ACE satellite provides real time solar wind speeds used by SWPC as a monitor of space weather and as an input for real-time models

Technique: Real-time solar wind speeds determined from ion-energy distributions measurements from the SWEFAM instrument

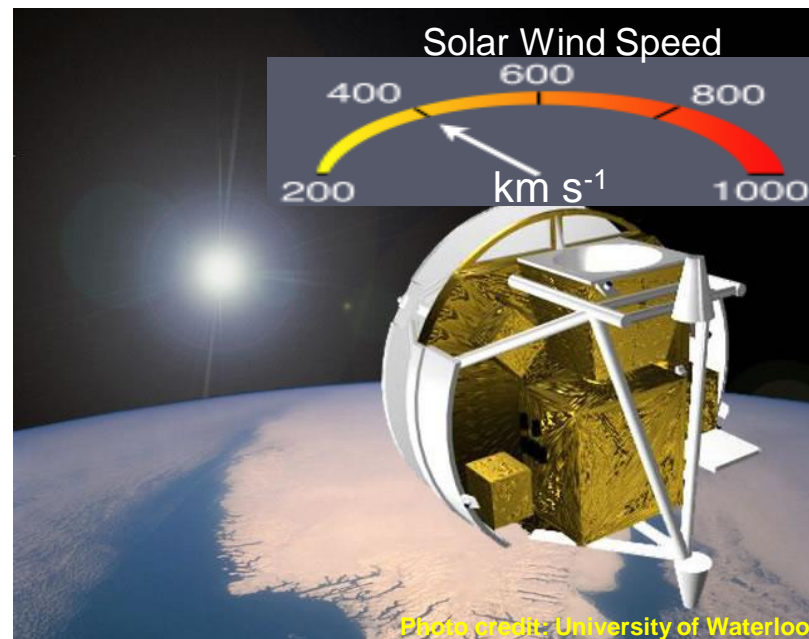
Issue: When energetic ions saturate SWEFAM, ACE gives false solar wind readings

Solution:

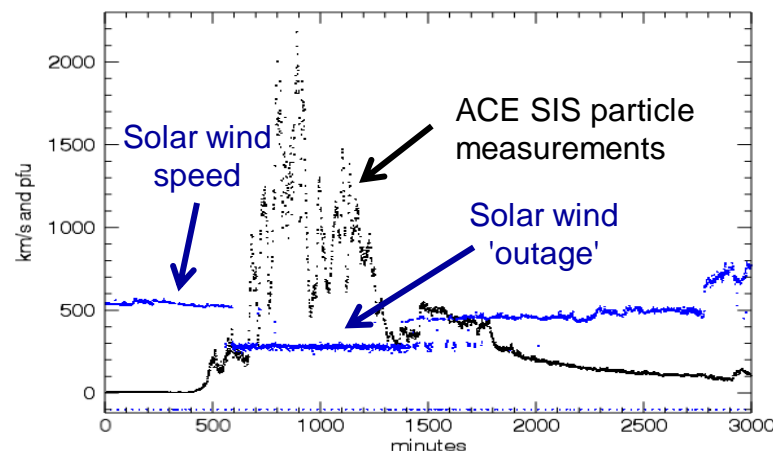
1. Identify these outages based on solar wind speeds and ion measurements from SIS instrument
2. Use time-based proxy for wind speed for during outages
  - a) for outages <30 hrs, use initial wind speed
  - b) for outages >30 hrs, use function  $v = \sqrt{a + b Kp}$ ; variables a & b [TBD]

Status: Undergoing validation – submit to the Space Weather Journal, if appropriate.

SWEFAM – Solar Wind Electron Proton Alpha Monitor  
SIS – Solar Isotope Monitor



Advanced Composition Explorer (ACE)

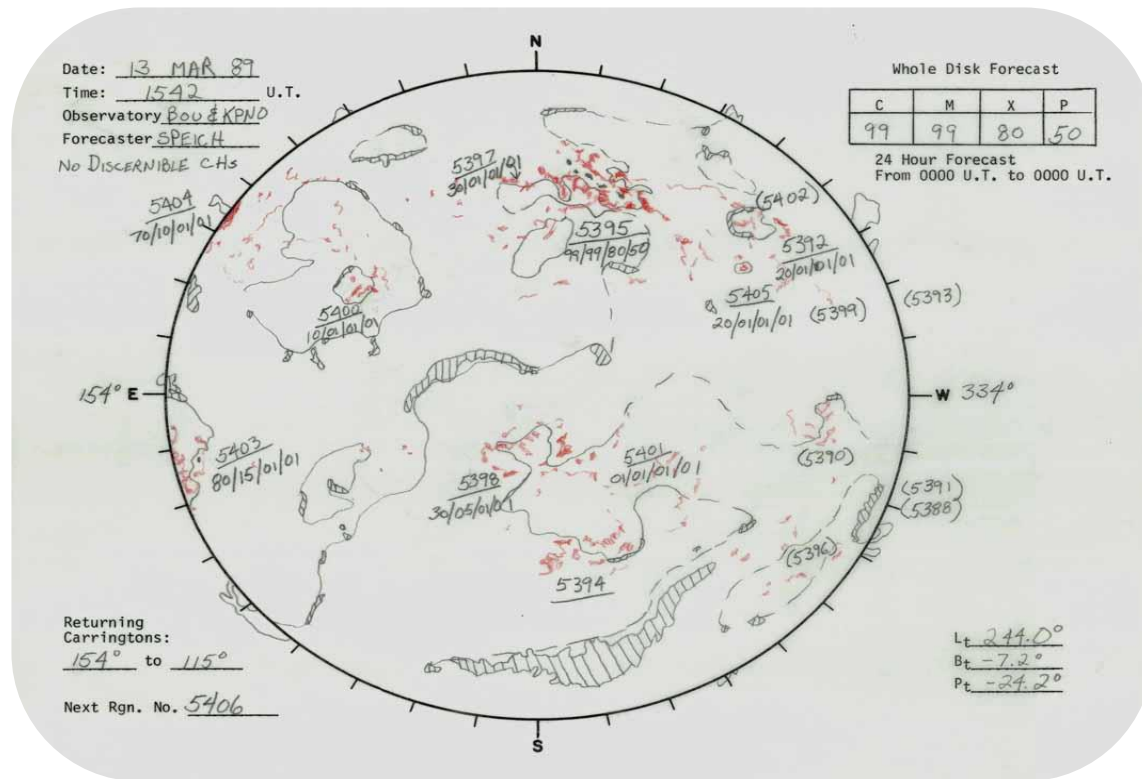




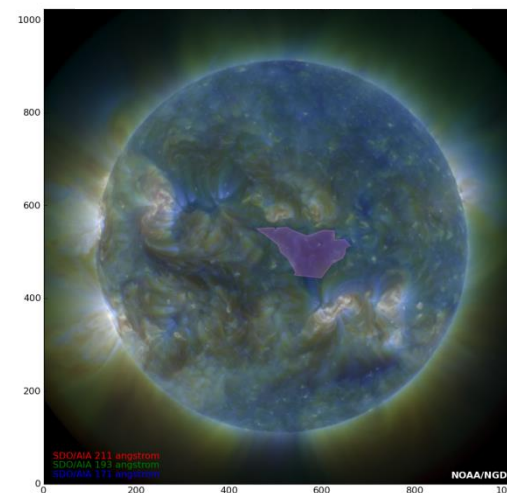
# Accomplishments & Updates SWPC Synoptic Analysis Drawings



Synoptic Analysis Drawings, also known as Neutral line (NL) drawings, are drawn each day by SWPC forecasters. These drawings provide a comprehensive view of the sun describing key solar features of interest such as magnetic neutral lines, coronal hole boundaries, active regions, plage, filaments and prominences. Also included is specific information about the coronal hole polarity, active region numbers, flare probabilities for each region and the proton event probabilities for each region. Drawings are available online from 1972 to present.



## Coronal Hole Detection



Future – Automatic classification techniques for solar regions is being developed under the GOES-R support program (Jon Darnel).



# Accomplishments & Updates

## Satellite Anomaly Information Services (SAIS)



### SAIS Data Portal

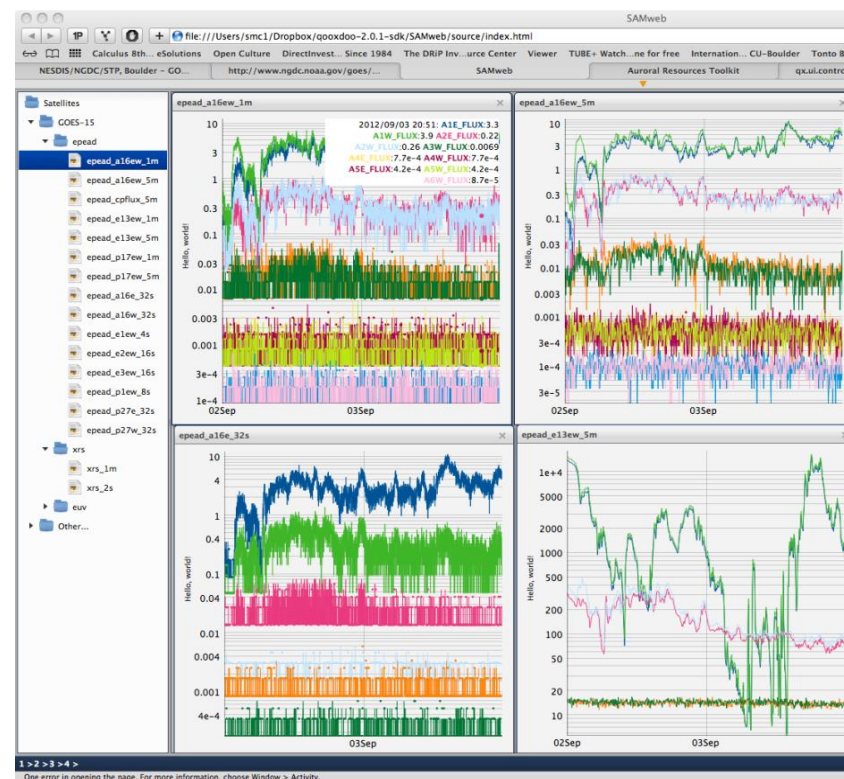
- Provides select data view for anomaly analysis
- Allows users to manipulate data display within their web browser
- Following standard web app development procedures per ARC discussion

### Anomaly Environmental Assessments

- GRAIL MoonKAM (Moon Knowledge Acquired by Middle school students)
  - Sally Ride science website says failure cause by “solar flare”
  - Colorado Astronomical Society Public Relations Lead wants to use anomaly as an educational tool on space weather hazards
  - No clear connection to space weather yet
- NPP CrIS entered safe mode on Jan 17<sup>th</sup>
  - Still under evaluation
- Orbital: Helping evaluate possible satellite vulnerabilities

### NEW Product: SEAESRT

- SWPC expects operations in March
- NGDC to archive ASCII output for display in SAIS portal



Powered by  
**ART / SPIDR**

ART – Auroral Resources Toolkit  
SPIDR – Space Physics Interactive Data Resource



# OUTLINE

## Solar & Terrestrial Physics Division



**STP Division Overview**

**Milestones & Performance Measures**

**Accomplishments & Updates**

**→ Issues & Summary**





# Issues & Summary

## STP CY12 Publications – 12



### Publications (CY12):

**Allen, J. H., C. A. Clark, W. F. Denig and D. C. Wilkinson** (2012), Historical Upper Atmosphere Geophysics Reports Now Available Online, *Space Weather*, 10, S05007, doi:10.1029/2012SW000802.

Araujo-Pradere, E.A., D. Buresova, **D.J. Fuller-Rowell**, and T.J. Fuller-Rowell (2012), Initial results of the evaluation of IRI hmF2 performance for minima 22-23 and 23-24, *Adv. Space Res.*, *in press*.

**Denig, W.F.** (2012), Space Weather Products for NOAA Satellites, *Earth System Monitor*, 19, pp.9.

**Elvidge, C. D., K.E. Baugh, S.J. Anderson, P.C. Sutton and T. Ghosh** (2012), The Night Light Development Index (NLDI): a spatially explicit measure of human development from satellite data, *Soc. Geogr.*, 7, 23-35, doi:10.5194/sg-7-23-2012.

**Green, J.** (2012), Space Weather Ready, *Earth System Monitor*, 19, pp.3.

**Machol, J.L., J.C. Green, R.J. Redmon, R.A. Viereck and P.T. Newell** (2012), Evaluation of OVATION Prime as a Forecast Model for Visible Aurorae, *Space Weather*, 10, S03005, doi:10.1029/2011SW000746.

**Redmon, R.J.** (2012), Upwelling to Outflowing Oxygen Ions at Auroral Latitudes during Quiet Times: Exploiting a New Satellite Database, PhD Thesis, University of Colorado, Boulder, CO.

**Redmon, R.J., W.K. Peterson, L. Andersson and W.F. Denig** (2012), A global comparison of O<sup>+</sup> upward flows at 850 km and outflow rates at 6000 km during nonstorm times, *J. Geophys. Res.*, 117, A04213, doi:10.1029/2011JA017390.

**Redmon, R.J., W.K. Peterson, L. Andersson, P.G. Richards** (2012), Dawnward shift of the dayside O<sup>+</sup> outflow distribution: The importance of field line history in O<sup>+</sup> escape from the ionosphere, *J. Geophys. Res.*, <http://dx.doi.org/10.1029/2012JA018145>.

**Rodriguez, J.V.** (2012), Undulations in MeV solar energetic particle fluxes in Earth's magnetosphere associated with substorm magnetic field reconfigurations, *J. Geophys. Res.*, 117, A06229, doi:10.1029/2012JA017618.

**Rodriguez, J.V., H.C. Carlson Jr., and R.A. Heelis** (2012), Auroral forms that extend equatorward from the persistent midday aurora during geomagnetically quiet periods, *Journal of Atmospheric and Solar-Terrestrial Physics*, 86, 6–24.

**Rowland, W., and R.S. Weigel** (2012), Intracalibration of particle detectors on a Three-axis Stabilized Geostationary Platform, *Space Weather*, 10, S11002, doi:10.1029/2012SW000816.



# Issues & Summary

## STP FY13 Presentations – 28 (1 of 3)



### YTD Presentations (FY13):

#### High Energy Particle Precipitation into the Atmosphere (HEPPA) – 09-11 October 2012, Boulder, CO

- Update on the NOAA Polar Satellite Program, Data, and Products (Poster), **J. Machol, J. Green, W. Denig, T. Sotirelis, D. Wilkinson, J. Rodriguez and R. Redmon**

#### Extreme Ultraviolet Variability Experiment (EVE) Science Meeting - 31 October -1 November 2012, Yosemite Valley, CA

- The Use of EVE Data at NOAA (Invited Oral), **J. Machol**

#### Conference on Space Environment Applications, Systems, and Operations for National Security (SEASONS), 14-16 November 2012, Laurel, MD

- NOAA Satellite Anomaly Program (Oral), J.C. Green (Paper presented by G. Fish)

#### American Geophysical Union, 03-07 December 2012, San Francisco, CA

- Intracalibration of Particle Detectors on a Three-Axis Stabilized Geostationary Platform (Poster), **W. Rowland**, and R. Weigel, (Paper: SM31B-2304)
- New NOAA resources for safeguarding the satellite infrastructure from space weather (Poster), **J.C. Green; W.F. Denig; J.V. Rodriguez; R.J. Redmon**; T.G. Onsager, H.J. Singer, W. Murtagh, R. Rutledge, J. Stankiewicz, J. Kunches and **D.C. Wilkinson** (Paper: SM23B-2316)
- NOAA People Empowered Products (PeEP): Combining social media with scientific models to provide eye-witness confirmed products (Oral), S. Codrescu, **J.C. Green, R.J. Redmon, W.F. Denig** and E.A. Kihn (Paper: IN23F-02) (Paper presented by J. Rodriguez)
- Non-standard Space Weather Products and Services from NOAA (Oral), **W.F. Denig** and R.A. Viereck (Paper: IN31D-03)
- Dawnward shift of the dayside O+ outflow distribution and the Influence of e- precipitation on ion upwelling in the nightside auroral zone (Poster), **R.J. Redmon**, L. Andersson, W.K. Peterson and P.G. Richards (Paper: SM41B-2215)
- GOES Observations of Pitch Angle Evolution During an Electron Radiation Belt Dropout (Poster), D.P. Hartley, M.H. Denton, **J.C. Green**, T.G. Onsager, **J.V. Rodriguez** and H.J. Singer (Paper: SM31C-234)
- Numerical Simulations of the Ring Current During Geomagnetic Storms (Invited Oral) M.W. Chen, C.Lemon, T.B. Guild, M. Schulz; J.L. Roeder; A.Lui, A.M. Keesee, J.Goldstein, G. Le and **J.V. Rodriguez** (Paper: SM32A-03)

[ftp://ftp.ngdc.noaa.gov/STP/publications/stp\\_presentations/stp\\_presentations.pdf](ftp://ftp.ngdc.noaa.gov/STP/publications/stp_presentations/stp_presentations.pdf)



# Issues & Summary

## STP FY13 Presentations – 29 (2 of 3)



### YTD Presentations (continued):

#### American Geophysical Union, 03-07 December 2012, San Francisco, CA (continued)

- Pulsating Aurora: the Equatorial Source Population & Local Morphological Interplay with Diffuse Aurora (Poster), A.N. Jaynes, M. Lessard, **J.V. Rodriguez**, K.M. Rychert, E. Donovan, R.G. Michell and M. Samara (Paper: SM43B-2240)
- Comparison of Geomagnetically-shielded Solar Energetic Proton Fluxes Observed at Geostationary Orbit by GOES and in Low-earth Orbit by SAMPEX, POES and MetOp (Poster), **J.V. Rodriguez**, J.E. Mazur, **J.C. Green** and **J.L. Machol** (Paper: SH33C-2243)
- Real-time mapping of combustion sources using Suomi NPP satellite VIIRS and CrIMSS data (Poster), M Zhizhin, C. Elvidge, K. Baugh and F.C. Hsu (Paper: IN33C-1553)

#### American Meteorological Society, 06-10 January 2013, Austin, TX

- The GOES-R Sudden Impulse Detection Algorithm (Poster), **W. Rowland**, **R. Redmon** and H.J. Singer (Paper 315)
- GOES-R solar extreme-ultraviolet irradiance: requirements, observations, and products (Poster), **J.L. Machol**, R.A. Viereck, A. Reinard, F.G. Eparvier, M. Snow, A.R. Jones, T.N. Woods, **W.F. Denig**, D.L. Woodraska and S. W. Mueller (Paper 304)
- Development of a Proxy Data Set for the Energetic Heavy Ion Sensor (EHIS) in the GOES-R Space Environment In-Situ Suite (Poster), **R. Bharath**, **J.V. Rodriguez**, **J.C. Green** and **W.F. Denig** (Paper 296)
- Improved Space Weather Monitoring for GOES-R (Invited Oral), **W.F. Denig** and S.M. Hill (Paper J2.4)
- Automatic Analysis of EUV Solar Features using Solar Imagery for the GOES-R SUVI (Poster), **J.M. Darnel**, S.M. Hill and **W.F. Denig** (Paper 660)

#### Asia Pacific Advanced Network (APAN), 13-18 January 2013, Honolulu, HI

- What is so great about nighttime VIIRS data for the detection and characterization of combustion sources? (Oral), **C. Elvidge**
- Using the short-wave infrared for nocturnal detection of combustion sources in VIIRS data (Oral), **M. Zhizhin**
- Estimating temperature and total radiant output for combustion sources detected at night in VIIRS data (Oral), **Feng-Chi Hsu**
- Ranking gas flares based on radiant output (Oral), **K. Baugh**
- Why VIIRS data are superior to DMSP for mapping nocturnal lighting (Oral), **C. Elvidge**
- A stray filter for improving the quality of VIIRS low light imaging data (Oral), **M. Zhizhin**
- The NGDC VIIRS reprojection toolkit (Oral), **M. Zhizhin**
- A VIIRS cloud detection system optimized for cloud-free compositing (Oral), **Feng-Chi Hsu**
- VIIRS cloud-free compositing for nighttime lights (Oral), **K. Baugh**



# Issues & Summary

## STP FY13 Presentations – 29 (3 of 3)



### YTD Presentations (continued):

#### Earth-Sun System Exploration 5 - January 13-19, Kona, HI

- Creation and analysis of a novel auroral dataset derived from DMSP satellite observations (Poster), **J.V. Mills**, **R.J. Redmon**, W. K. Peterson, L. Andersson and **W.F. Denig**.
- Dynamic auroral boundaries and ion energization: Solar cycle 23 (Oral, Invited), **R.J. Redmon**, W.K. Peterson, L. Andersson, P.G. Richards, **W.F. Denig** and **J. Mills**.





# Issues & Summary

## Solar & Terrestrial Physics Division



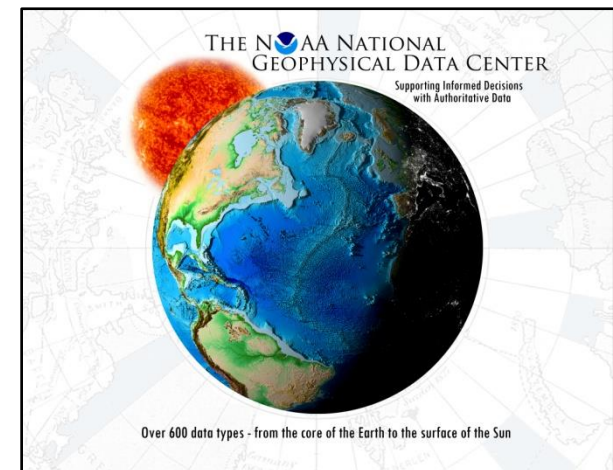
- ✓ Federal travel restrictions limit program growth (4QFY12) – active
- ✓ Fed hiring restrictions having mission impact (3QFY12) – *active*
- ✓ GOES-R L2+ SWx algorithms (3QFY11) – *stalled (no action)*

### Metrics

Papers Published (CY12 Final): 12

Presentations (FY13 YTD): 29

Indices Bulletins: 1





# QUESTIONS?

